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Tropical butterflies of the Mediterranean

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Introduction

This paper aims at reviewing the tropical butterflies of the Mediterranean basin in order to see whether any general conclusions can be drawn. To my knowledge such a review has not previously been attempted, and there are no publications dealing with the butterflies of the entire Mediterranean. The data are scattered in various publications, most of which are written by authors with little personal knowledge of tropical butterflies. The paper owes its origin to my preoccupation over the last fifteen years with the butterflies of Lebanon (Larsen, 1974), Jordan (Larsen & Nakamura, 1983), and Arabia (Larsen, 1983, 1984a). The final decision to go ahead was taken when I had finalised the zoogeographic analysis of Arabian butterflies (Larsen, 1984b).

By tropical for the purposes of this paper I mean species which have the major part of their distribution in the tropics, belonging to genera which are wholly tropical, and in one or two cases species that are endemic, but which clearly belong to essentially tropical genera. I do not consider tropical those few genera which have both tropical and Palaearctic representatives (e.g. *Papilio, Neptis, Everes*), nor those cases where obviously Palaearctic genera maintain a montane toehold in the tropics (e.g. *Pieris, Colias, Lycaena, Melitaea, Lasiommata*). Also excluded are the Eremic species (sensu Larsen, 1984b) which are specially adapted to the arid zone stretching from Mauretania to Arabia and northwestern India into Central Asia (e.g. *Elphinstonia, Apharitis, Tarucus, Gegenes*).

The next section will give a brief characteristic of each of the tropical species found in the Mediterranean. They can be grouped into one of four main categories : 1) *Afrotropical*, i.e. species that have evolved in Africa, though some have since managed to penetrate India ; 2) *Oriental*, i.e. species that have evolved in the Asian tropics ; 3) *Palaeotropical*, i.e. species that have a wide distribution in the Old World tropics with no definite clue as to their ultimate origin ; 4) *Neotropical*, i.e. species of American tropical origin, which is only the case of *Danaus plexippus* Linné. Finally the zoogeographical status of *Libythea celtis* Laicharting is obscure.

The tropical species of the Mediterranean

PIERIDAE

Anaphaeis aurota FABRICIUS

The distribution of this powerful migrant covers most of dry Africa and the Indian sub-continent. It is best classified as Palaeotropical, though it is possibly of Afrotropical origin. Migration is probably a necessary part of its survival kit, since it occurs in numbers in places where it cannot survive all year (for two major migration events, see LARSEN, 1977, 1982). In the Mediterranean it has been recorded from Egypt, Sinai, Israel and Lebanon. The occurrence, however, is most irregular. It does not appear to have been seen in Lebanon since 1937, nor in Israel and the Sinai since 1969. That year it occurred in masses on *Capparis*. I found it very common in Cairo in late 1970, but did not see it in successive years. There is also a single record from Malta.

Colotis phisadia phisadia GODART

This species is an inhabitant of what may roughly be called the Sahel belt, stretching from Mauretania to Arabia and India. The Indian subspecies is distinctive. The larvae feed only on the plant genus *Salvadora*, which is found also in the Jordan Valley and the Sinai. The species is migratory and in the Jordan Valley it has been seen migrating northwards beyond the range of the larval food plant (LARSEN & NAKAMURA, 1983). In the area under review it is only known from the Jordan Valley and the East Sinai. Despite its migratory potential it is unlikely to be found elsewhere in the area. The Indian population of this species is almost certainly recent and the species is best classified as Afrotropical.

Colotis chrysonome KLUG

The world wide distribution of this butterfly is very much like that of the preceding species, except that it does not extend further east than Oman, even though its food plants of the genus *Maerua* (Capparidaceae) occur in India. Contrary to the previous species it has a close relative south of the Sahara. In the area under review it is only known from the Dead Sea depression where it is very much scarcer than *C. phisadia* and is considered extinct on the Israeli side. It is obviously an Afrotropical species. Since it displays some migratory tendencies, the Dead Sea population may be in intermittent contact with the Hejaz populations.

Colotis evagore KLUG

This butterfly is common and widespread in dry Africa, less so in south-western Arabia. It penetrates the Mediterranean area in Algeria, Tunisia and

Morocco, and is locally common in southern Spain. It is somewhat migratory but appears to have established some permanent foot-holds. The food plant is *Capparis*. It is, perhaps, surprising that it has not colonised the Dead Sea area.

Madais fausta fausta OLIVIER

This pretty butterfly has the distinction of a distribution pattern unmatched by any other butterfly, excompassing most of India and Sri Lanka, Pakistan, southern Iran, Iraq, the Arabian Peninsula, Sinai, Israel, Jordan, Lebanon and Syria. There is only the slightest penetration of East Africa. In Arabia and the eastern Mediterranean this Oriental butterfly is strongly migratory, feeding on *Capparis spinosa* whose supply of fresh leaves is highly seasonal. The Indian subspecies seems to be non-migratory and to feed exclusively on *Maerua* (pers. obs.). It is occasionally met with in Lower Egypt, but only east of the Nile, and while it reaches Lebanon every year in varying numbers, it is only occasional in southern Turkey. The remarkable record of a specimen from Ennedi, deep in the Sahara (BERNARDI & GILLET, 1962) indicates that strays might occur elsewhere in the Mediterranean. There are, however, no records from Cyprus.

Catopsilia florella FABRICIUS

This is a regular and powerful Palaeotropical migrant with a vast distribution in Africa, Arabia, the Indian sub-continent and parts of Indochina and China. It is a regular visitor to Lower Egypt, possibly resident in Upper Egypt, but irregular in the Sinai, Israel, Jordan and Lebanon. During the past fifty years it has been very scarce in this area. In 1974 there was a significant population build-up, but it certainly did not reach Lebanon (LARSEN & NAKAMURA, 1983) though it was common in Israel where the species had not been seen for long. I saw a single specimen in Beirut in 1977 (LARSEN, 1978a). A stray specimen has been recorded from Malta, which would not be surprising, and from Germany which certainly is. Around 1964 the species successfully invaded the Canary Islands and seems to have established permanent breeding populations, something that has not happened in Lower Egypt. The larval food plants are species of *Cassia*, often grown as ornamental tress and shrubs in gardens.

LYCAENIDAE

Deudorix livia KLUG

This is a somewhat migratory Afrotropical species, limited to tropical Africa north of the rainforest belt and north of the Equator in the East. It is common in southern Arabia, and has been collected in SW Iran on a few occasions.

It is also a regular visitor to the eastern Mediterranean (Lebanon, Israel, Sinai and Jordan) and it may be a permanent resident of Egypt. The larval food plants are very varied, including many Leguminosae and dates, but pomegranate seems a favourite, and it may acquire pest status. It should turn up also in Adana in Turkey.

Iolaus glaucus WALKER

In some respects this is the most tropical of the Mediterranean species, belonging to a genus that is strongly centered on the African forests, and only marginally penetrating the dry ecological zones of Africa. The species is found from Somalia, Sudan and southwestern Arabia, to Dhofar and the Dead Sea depression. The larva feeds on *Loranthus* infesting tropical trees. In our area it will never be found outside of the Jordan Valley where it is localised and generally rare. There are no records from the Jordanian banks of the valley, but it is certain to occur there.

Lampides boeticus LINNÉ

This powerful Palaeotropical migrant regularly pushes itself more than four kilometres up the Himalaya to breed, as well as into the Palaearctic as far north as Germany and the UK. The only Danish specimen was caught in a greengrocery and was probably imported as a pupa. In Delhi there is on average one *L. boeticus* to 150 g peas from the local market. It is common in most Mediterranean countries, but the extent to which this butterfly actually has permanent breeding populations, or whether it is dependent on eternal nomadism deserves formal scientific investigation.

Syntarucus pirithous LINNÉ

The range of this Afrotropical species covers all of sub-Saharan Africa and southwestern Arabia. It is migratory and has been found in all Mediterranean countries, and it sometimes spreads further north. The extent to which Mediterranean populations of this butterfly are truly sedentary and could permanently survive is in doubt. My own observations in Lebanon were that it could not (LARSEN, 1974), and PARKER (1983) specifically agrees with me that it is not generally resident on Cyprus. It is certainly a permanent resident of Lower Egypt, where it may be very numerous. The larval food plants are very varied. One species of *Syntarucus* exists in the Oriental Region, but this is more closely related to *S. babaoulti* STEMPFFER than to *S. pirithous.*

Azanus jesous GUÉRIN

This is a strongly migrant Afrotropical species, common throughout Africa and Arabia, but less common in most of India. The larval food plants are *Acacia.* The Arabian population penetrates into Jordan, Israel and Lebanon,

though it is very sporadic outside of the Jordan Valley proper. PARKER (1983) records the first specimens from Cyprus. There are, curiously enough, no Egyptian specimens at all. The species has also been noted from Morocco, but so far south that it does not qualify as Mediterranean. LEDERER described a special Mediterranean subspecies, *gamra* LEDERER. Since STEMPFFER (1938) supported LEDERER on the basis of genital morphology, I accepted this view. Examination of larger series shows STEMPFFER's grounds to be invalid and a distinct Mediterranean subspecies should not be recognised (LARSEN, 1983).

Azanus ubaldus CRAMER

This tiny butterfly is widely distributed in dry tropical Africa, Arabia and India, extending to Aqaba and the lower Jordan Valley in Israel and Jordan, as well as to the Sinai. There are no records from Lower Egypt where it should be expected. The species is migratory, its presence in India recent, and it should be considered Afrotropical rather than Palaeotropical. There is a single record from desert Tunisia. As with the preceding species the food plants are *Acacia.* It is even less resident in the Mediterranean than is *A. jesous.*

Zizeeria karsandra karsandra MOORE & *Zizeeria knysna* TRIMEN

This is an Oriental butterfly whose distribution range is quite disproportional to its size. It is found in Australia, many of the islands in the Pacific, and throughout the Oriental Region to Afghanistan, Iran, Iraq and Arabia. In Arabia it is common in Oman and much of eastern and central Arabia, from where it extends to Lebanon, Israel, Jordan and the Sinai. It is particularly common in the Delta of the Nile, and is locally common on the island of Cyprus. There are populations also on Crete and on Sicily. *Z. karsandra* extends along northern Africa to Algeria where it meets the Afrotropical sister species *Z. knysna* TRIMEN, which is widespread throughout Africa. The two are sometimes considered conspecific, but the genitalia differ and the African species has hairy eyes, while those of the Oriental species are naked. *Z. karsandra* is a very sedentary species, and its populations may inhabit localities of a few square metres. It is usually associated with moist patches where various Leguminosae grow. In Arabia it may be very common on lucerne. The distribution pattern is enigmatic, and does not match that of any other species. However, GABRIEL & CORBETT (1949) insisted that they found the Oriental form of the genus *Zizina* in the Siwa oasis, which would correspond to what is now known as *Z. otis* Fabricius. I have not been able to examine the single specimen in question, but the data given in the paper would not exclude the African vicariant *Z. antanossa* MABILLE. In either case the disjunction of range is impressive. *Z. otis* extends to Pakistan, *Z.*

antanossa to somewhere in the Sudan. There ought to be meeting points between *Z. karsandra* and *Z. knysna* also in the Nile Valley and in the Hejaz of Arabia. These have so far not been investigated and deserve scientific attention.

NYMPHALIDAE
LIBYTHEINAE

Libythea celtis celtis LAICHARTING

This species could have been left out of the review on the same grounds as *Neptis*, but it does seem to be a Palaearctic representative of an essentially tropical genus. The dozen or so species known are widely distributed in the Old World tropics, and a very similar genus *Libytheana* is Neotropical, with irradiations into the Nearctic. *L. celtis* has been noted from Algeria, Tunisia, Spain, France, Italy, Yugoslavia, Greece, Turkey and Cyprus. It has not been recorded from Lebanon, Jordan or Israel, which is puzzling as conditions seem right. SHIELDS (1985) cites a specimen from Palestine (Kedes) which is unlikely, and the locality sounds Turkish. All Libytheinae feed on *Celtis*, an ancient plant genus matching the world wide distribution of the butterfly sub-family. *L. celtis* is the northern-most, almost temperate, representative of an otherwise tropical group, showing a decided relict character. Oligocene butterfly fossils closely resembling existant *Libythea* have been found in North America. *L. celtis* is found from the Mediterranean to Japan, but the definition of species in the complex is difficult.

CHARAXINAE

Charaxes jasius LINNÉ

This is one of the most spectacular butterflies endemic to the Mediterranean, where it has been recorded from all the Mediterranean countries except for Libya, the Sinai and Egypt. Normally it is localised and uncommon, but it is definitely a non-migratory resident that has adapted to Mediterranean conditions. It is clearly related to the African group of Charaxes encompassing the species *epijasius* REICHE, *saturnus* BUTLER and *legeri* PLANTROU. The two former have from time to time been considered subspecies of *C. jasius*, but the distribution and overlap between the three African taxa support neither view. The recent discovery of *C. legeri* throws further doubt on attempts to unite the Mediterranean species with any of the African. The normal larval food plant of *C. jasius* is *Arbutus*, but it has recently been suggested that it will accept *Citrus*. In July 1970 I collected a female at Petaloudes in Rhodos which was carefully investigating a *Citrus* tree.

NYMPHALINAE

Hypolimnas misippus LINNÉ

This is a powerful and widely distributed migrant throughout the tropics of the Old World, and more recently it has established itself in the Caribbean. It is a regular visitor to Egypt, and a very rare visitor to Lebanon and Israel. In exceptional years it can survive a winter in Lebanon and for a few years early this century it was temporarily established in Beirut.

Junonia hierta cebrene TRIMEN

This common Palaeotropical species has a distinct subspecies in India ; the African form reaches the Mediterranean on rare occasions as a migrant. Apart from a very old Lebanon record (figured in LARSEN, 1974 : plate 113), there are more recent records from the Sinai (BENJAMINI, 1984), and from Lower Egypt (pers. obs.). There are several observations of active migration of the African subspecies, i.e. in Upper Egypt (WILTSHIRE, 1948), in Benin (LARSEN, 1978b) and in Nairobi (LARSEN, 1985). All Mediterranean specimens are unequivocally of the African subspecies, and although the species might be able to breed during summer, it almost certainly could not survive winter.

Junonia orithya here LANG

This Palaeotropical migrant was recently taken for the first time in the Upper Jordan Valley near Lake Tiberias. The single male can be assigned to the Arabian subspecies without a shadow of doubt (LARSEN, 1984c). It ought to occur more frequently, not least since it regularly migrates north to Bagdad and beyond (WILTSHIRE, 1957).

SATYRINAE

Ypthima asterope asterope KLUG

This is a Palaeotropical species that does not migrate. It is found in most of dry Africa, in southern Arabia and in India. It seems to be absent from Iran and Iraq, eastern and central Arabia, the northern Hejaz, Sinai, Egypt and the south of Jordan and Israel. It then recurs as a resident species in Israel, Jordan, Lebanon, southern Turkey and Cyprus. At present the Levant population seems to be disjunct, but it may have had recent contact with Arabia. A specimen from Lebanon had an unusually low haploid chromosome number of n = 14 (LARSEN, 1975), which was also the case in Yemen (SAITOH, 1984), so there is no doubt that the same taxon is involved. The absence of *Y. asterope* from any part of Egypt is puzzling.

DANAINAE

Danaus plexippus LINNÉ

This is the migrant butterfly *par excellence*. It is Neotropical of origin and is best known for its back and forth migrations from the Great Lakes region of USA and Canada to Mexico where it passes winter. The winter roosts are in geographical terms minute. About a hundred years ago breeding colonies became established on the Azores and the Canary Islands (and in Australia and Papua New Guinea). Sporadic specimens reach Spain and Portugal, where they may occasionally breed during summer.

Danaus chrysippus chrysippus LINNÉ

This is a well known Palaeotropical migrant. The populations of Africa, the Middle East and much of Asia proper are subspecifically undifferentiated, though the frequency of the three basic polymorphic forms vary geographically. There are distinct subspecies from Java to Australia. It is a frequent migrant into the Palaearctic, and has resident populations in the Canary Islands, Lower Egypt, and probably the Jordan Valley. It is a regular visitor to Jordan, Israel, Sinai and Lebanon, much less so to southern Turkey and Cyprus. There are very sporadic records from Greece and Italy, though there was a colony near Naples that survived for a few years last century, according to Verity. Records from Tunisia and Morocco are more frequent, and it must also occur in Algeria. During the 1980ies it has been seen in Spain more frequently than ever before, and breeding has been recorded. Local entomologists actually speak of a colonisation, but that is very premature. A series of severe winters will doubtless kill off the supposed resident populations as happens on the Lebanese coast. The geographical variation of the species in the area under review cannot be covered by the conventional subspecies. Three distinct populations have relevance. The Indian population is essentially monomorphic in the nominate morph. It predominates in eastern Arabia and Oman, extending to the eastern Mediterranean and Egypt. ELLISON (in ELLISON & WILTSHIRE, 1939) says : 'I am inclined to look with suspicion on LEDERER's records of f. *dorippus* KLUG (wingstip without the normal black and white pattern) and of f. *alcippus* FABRICIUS (hindwing white), as neither has been found in the Lebanon since. Either alone would pass muster (I have seen f. *alcippus* from Cyprus), but it would be a remarkable stroke of luck to capture both'. Quite so, on available evidence. Now, the population in southwestern Arabia (and East Africa) produces a mix of these three distinct forms, as well as occasional specimens of f. *albinus* LANZ. which has white hindwings and no black/white markings on the forewings. This population cannot be involved in populating the eastern Mediterranean. PIERRE (1974) surveying large museum collections was able to find only one f. *dorippus* in the Mediterranean. Generally speaking all

Mediterranean material of *D. chrysippus* is of the nominate form, and this is especially true of the resident population of the Canary Islands. This leaves no doubt that the East Mediterranean population, derived from India, has been mainly responsible for populating the Mediterranean because the West African population is monomorphic in the form *alcippus*. This form does occasionally reach the Mediterranean. According to CHNEOUR (1954) large numbers, all with white hindwings, reached Tunisia in July 1952, and were also recorded in Morocco. April 1952 specimens from Malta also pertained to this form (VALLETTA, 1971). They are also said to have reached the Canary Islands, but they cannot have been successful since the population to-day is 100% *chrysippus*. I remember reading somewhere that the West African f. *alcippus* is non-migratory, but this is not so. I have once seen a mixed migration in Benin towards the northeast, dominated by *C. florella*, but containing at least 200,000 *D. chrysippus* f. *alcippus* (LARSEN, 1978b). The place of observation (Natitingou, April 1978) was some 1800 km SSW of Tunisia, by no means impossible for Danaid migration. *Danaus plexippus* regularly flies 3000 km between its breeding grounds and its winter roosts. *Parantica sita* KOLLAR in Japan has been recaptured after 1100 km (FUKUDA *et al.*, 1982), and LARSEN & PEDGLEY (1985) describe an accidental displacement of *Danaus genutia* CRAMER and *Tirumala limniace exoticus* GMÉLIN from India to eastern Arabia, a distance of nearly 2000 km. The status of *D. chrysippus* in the Mediterranean may now be summarised as follows. The resident populations of Egypt and, probably, the Jordan Valley, are monomorphic in the typical morph, indicating its affinities with India and the Gulf. This population at some stage colonised the Canary Islands, probably recently, since they are dependent on an imported species of *Asclepias* which is shared with the recent arrival, *D. plexippus*. These two populations reach the Mediterranean from time to time, but it is only rarely that colonies survive winter. Very occasionally (such as in 1952) the pattern is disturbed by the arrival of large numbers of f. *alcippus* from West Africa, but they seem to leave little genetic trace. Currently there is much growth in *D. chrysippus* populations in Spain, all of the nominate form. Doubtless a couple of severe winters will cause their extinction. A word of caution is in place, however. Never trust a Danaid butterfly ! During this century the entire population of *D. chrysippus* in Malaysia and northern Sumatra has changed from near 100 percent f. *chrysippus* to near 100 percent f. *alcippus*. A startling reversal, with no reasonable explanation.

HESPERIIDAE

Pelopidas thrax thrax HÜBNER

This is a Palaeotropical migrant, common in Africa, Arabia and on the Indian subcontinent. It is a regular visitor to Israel, Lebanon, Jordan and

Cyprus. It may be permanently resident in Lower Egypt, and should occur in the Sinai though firm records are not on hand.

Borbo borbonica ?? zelleri LEDERER

This is an Afrotropical species with great powers of dispersal, found throughout Africa and many of the off-shore islands. It has not been reliably recorded from Arabia, however. There is considerable variation in Africa, including genitalia, and the species might cover more than one taxon. The definition of a Mediterranean subspecies, ssp. *zelleri*, does not really have much merit. It seems quite likely that the Moroccan and Egyptian populations are linked to different African populations. It may be a permanent resident of Lower Egypt, though this is not certain. I found it very common in Alexandria gardens in October 1972, but it is normally scarce. It is very sporadic in Lebanon, Jordan, and Israel. It has also been recorded from Algeria, Morocco and Gibraltar, but only rarely and some records are suspect.

Discussion

This concludes the summary of the twenty-four tropical species so far known from the Mediterranean. The data are summarised in Table 1 below for various parts of the Mediterranean.

A number of interesting findings emerge from Table 1.

First, the number of species comes to only 24. They are sharing the same habitat with somewhere about 200 Palaearctic species, comprising about ten percent of the total number. Two of these species are only found in the Dead Sea area which is a genuine extension of ecological conditions in Arabia, and several other species have been found only once or twice. Thus the proportion of species that are resident or at least regular visitors is even lower.

Second, no less than nineteen of the tropical species are known migrants, 80 percent of the total. Of these nine are among the most mobile and widely distributed species anywhere in the world. Only five of the tropical species are definitely sedentary.

Third, there is obviously very little morphological differences between the Mediterranean populations of tropical butterflies and their closest resident tropical populations. *Libythea celtis* and *Charaxes jasius* are specifically distinct and probably archaic. All other species are subspecially identical or at best very slightly, and doubtfully, differentiated. Thus the long accepted ssp. *gamra* LEDERER is definitely not true, and despite the very little comparative material available, ssp. *zelleri* LEDERER of *Borbo borbonica* is most doubtfully valid.

Table 1

Distribution of tropical species in the Mediterranean, their zoogeographic origin, migratory tendency, and the extent to which they are taxonomically distinct from neighbouring populations in the tropics

Species	TUN	MOR	ESP	FRA	ITA	YUG	GRE	TUR	CYP	LEB	ISR	EGT	ZOOGEO	MIG	DIFF
Anaphaeis aurota	–	–	–	–	–	–	–	–	–	●	●	●	PALTROP	very	no
Colotis phisadia	–	–	–	–	–	–	–	–	–	–	●	–	AFTROP	some	no
Colotis chrysonome	–	–	–	–	–	–	–	–	–	–	●	–	AFTROP	some	no
Colotis evagore	●	●	●	–	–	–	–	–	–	–	–	–	AFTROP	some	no
Madais fausta	–	–	–	–	–	–	–	●	–	●	●	●	ORIENT	very	no
Catopsilia florella	–	–	–	–	–	–	–	–	–	●	●	●	PALTROP	very	no
Deudorix livia	–	–	–	–	–	–	–	–	–	●	●	●	AFTROP	some	no
Iolaus glaucus	–	–	–	–	–	–	–	–	–	–	●	–	AFTROP	no	no
Lampides boeticus	●	●	●	●	●	●	●	●	●	●	●	●	PALTROP	very	no
Syntarucus pirithous	●	●	●	●	●	●	●	●	●	●	●	●	AFTROP	some	no
Azanus jesous	–	–	–	–	–	–	–	–	●	●	●	–	AFTROP	some	no
Azanus ubaldus	●	–	–	–	–	–	–	–	–	–	●	–	AFTROP	some	no
Zizeeria karsandra	●	–	–	–	●	–	●	–	●	●	●	●	ORIENT	no	no
Zizeeria knysna	–	●	●	–	–	–	–	–	–	–	–	–	AFTROP	no	no
Libythea celtis	●	–	●	●	●	●	●	●	●	–	–	–	?	some	yes
Charaxes jasius	●	●	●	●	●	●	●	●	●	●	●	–	AFTROP	no	yes
Hypolimnas misippus	–	–	–	–	–	–	–	–	–	●	●	●	PALTROP	very	no
Junonia hierta	–	–	–	–	–	–	–	–	–	●	–	●	PALTROP	very	no
Junonia orithya	–	–	–	–	–	–	–	–	–	–	●	–	PALTROP	some	no ([1])
Ypthima asterope	–	–	–	–	–	–	–	●	●	●	●	–	PALTROP	no	no
Danaus plexippus	–	–	●	–	–	–	–	–	–	–	–	–	NEOTROP	very	no
Danaus chrysippus	●	●	●	–	●	–	●	●	●	●	●	●	PALTROP	very	no
Pelopidas thrax	–	–	–	–	–	–	–	–	●	●	●	●	PALTROP	some	no
Borbo borbonica	●	●	●	–	–	–	–	–	–	●	●	●	AFTROP	very	? no ?
TOTAL	9	7	9	4	6	4	6	6	9	15	19	12	24		

([1]) recorded once from Jordan, a few kilometres from the Israeli border

TUN = Tunisia ; MOR = Morocco ; ESP = Spain and Portugal ; FRA = southern France ; ITA = Italy ; YUG = Yugoslavia ; GRE = Greece ; TUR = southern Turkey ; CYP = Cyprus ; LEB = Lebanon ; ISR = Israel ; EGT = Lower Egypt. AFTROP = Afrotropical ; PALTROP = Palaeotropical ; ORIENT = Oriental ; NEOTROP = Neotropical ; MIG = migratory ; DIFF = taxonomically distinct.

Fourth, very few of the tropical species have a wide Mediterranean distribution. *Charaxes jasius* and *Libythea celtis* are local, but occur in breeding populations that are sedentary in most of the Mediterranean countries, though the latter also migrates. The two migrant Lycaenidae, *Lampides boeticus* and *Syntarucus pirithous*, are the most widely distributed on the Mediterranean tropical species, being found in all countries, and regularly pushing far north into Europe. I suspect that in most of the area these two butterflies cannot be assured of continued survival and that individual populations regularly become extinct, even though they may survive intact for years. They are probably safe from such a cycle in Lower Egypt but perhaps not even there. The fifth and last of the widely distributed species is *Danaus chrysippus*, but that is only because it is such a dedicated migrant. It can only rarely survive winter in the Mediterranean.

There are three relatively sedentary species in the Mediterranean area proper : *Zizeeria karsandra* in the eastern Mediterranean to Algeria, including Cyprus, Crete and Sicily ; its close relative *Z. knysna* in Morocco, Algeria and southern Iberia ; *Ypthima asterope* in the eastern Mediterranean, excluding Egypt, including Cyprus.

Most of the tropical species share one or more of the following characteristics : They occur only sporadically ; they fluctuate considerably in numbers ; they have been recorded only infrequently ; they are limited to very special ecological conditions at the edges of the area under review ; they are migratory ; or they are not subspecifically distinct from other neighbouring populations in the tropics proper. Thus, most are adventive, colonising species which reach their outer limits in the Mediterranean basin, much in the same way as *Pontia daplidice, Vanessa atalanta* and *Colias croceus* do in northern Europe. It is worth noting that as much as eight of these species are found on the remote Cape Verde Islands in the Atlantic off Dakar (Bauer & Traub, 1981). Here they constitute no less than 35 percent of an impoverished fauna in one of the world's more godforsaken spots.

There are only five species that do not meet two or more of the criteria listed in the previous paragraph. Their presence seems more integral and in some cases of considerable antiquity. The world-wide distribution of the two species of *Zizeeria* and their presence on many Oceanic Islands makes it tempting to consider them sister-species of pre-Gondwanic disintegration. This temptation, at present, will be resisted. However, the presence of *Z. karsandra* in North Africa and the Levant and the distribution of the two species in Arabia indicates an ancient pattern pre-dating the Pleistocene.

The good adaptation to Mediterranean conditions of *Charaxes jasius* and *Libythea celtis*, and their specific status, suggest a relict status, especially in the case of the former. A Pliocene or early Pleistocene establishment seems

probable. Finally, *Ypthima asterope* is well established in the eastern Mediterranean and sedentary. Its presence also on Cyprus suggests a certain antiquity. If very recent, then its presence in the Mediterranean makes it the only successful recent coloniser that is not migratory.

The zoogeographical composition of the tropical species is listed in Table 2 below.

Table 2
Zoogeographic composition of the tropical butterflies of the Mediterranean

Zoogeographical category	Number	Percent
Afrotropical	11	46
Oriental	2	8
Neotropical	1	4
Palaeotropical	9	38
Uncertain	1	4
Total	24	100

There is little to be surprised about in the table. Only six Oriental species penetrate any part of the Arabian Peninsula (Larsen, 1984b), so more than two in the Mediterranean could hardly be expected. Nearly half the species are Afrotropical, which matches the positioning of the Mediterranean and the fact that penetration takes place both in Morocco and in the extreme East via Arabia. That more than a third of the species should fall in the Palaeotropical category is also not surprising. With the exception of *Ypthima asterope* they tend to be among the most aggressive migrants. Where there is subspecific distinction, such as in the two *Junonia*, it is the Afrotropical or Arabian subspecies that is found, not the Oriental. As mentioned, some of the Palaeotropical species are probably ultimately Afrotropical.

The final conclusion must therefore be that the tropical element in the Mediterranean basin, colourful and interesting as it is, has only marginal biogeographical importance. It is a recent addition of a mixed bag of adventive species that is not fully established, though four or five species might merit closer study. This is in marked contrast to the Palaearctic butterflies of Africa and southwestern Arabia. Most of these are subspecifically or specifically distinct, normally sedentary, and of considerable antiquity (Larsen, 1984b). But that is another story.

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